and Incomes commission

sion des prix et des revenus

July 23, 1971

West Memorial Building
344 Wellington Street
OTTAWA, Ontario
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(2)

General publications

26-303

STEEL PRICES

Prices and Incomes Commission

John H. Young
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Canada

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FOREWORD

Business firms in Canada were called upon in February, 1970, following the National Conference on Price Stability, to reduce the number and size of price increases they would normally make. Specific pricing criteria were formulated for varying sectors of the business community to apply during calendar year 1970. The Commission announced, following a series of meetings with the business community in late 1970, that while the formal restraint program would come to an end on Dec. 31, 1970, it would maintain its surveillance of increases in prices, wages, salaries, professional fees and other forms of income and would continue to conduct investigations and issue reports in particular cases.

Selected price increases are being studied in order to establish and document the various factors which contribute to price increases. The main purpose of these fact-finding studies is to inform governments and the public of the circumstances and implications of particular price changes, not to evaluate price changes against specific criteria. Where price increases occurred in 1970 or where firms request such an evaluation, however, the pricing criteria applicable in 1970 are used.

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STEEL PRICES

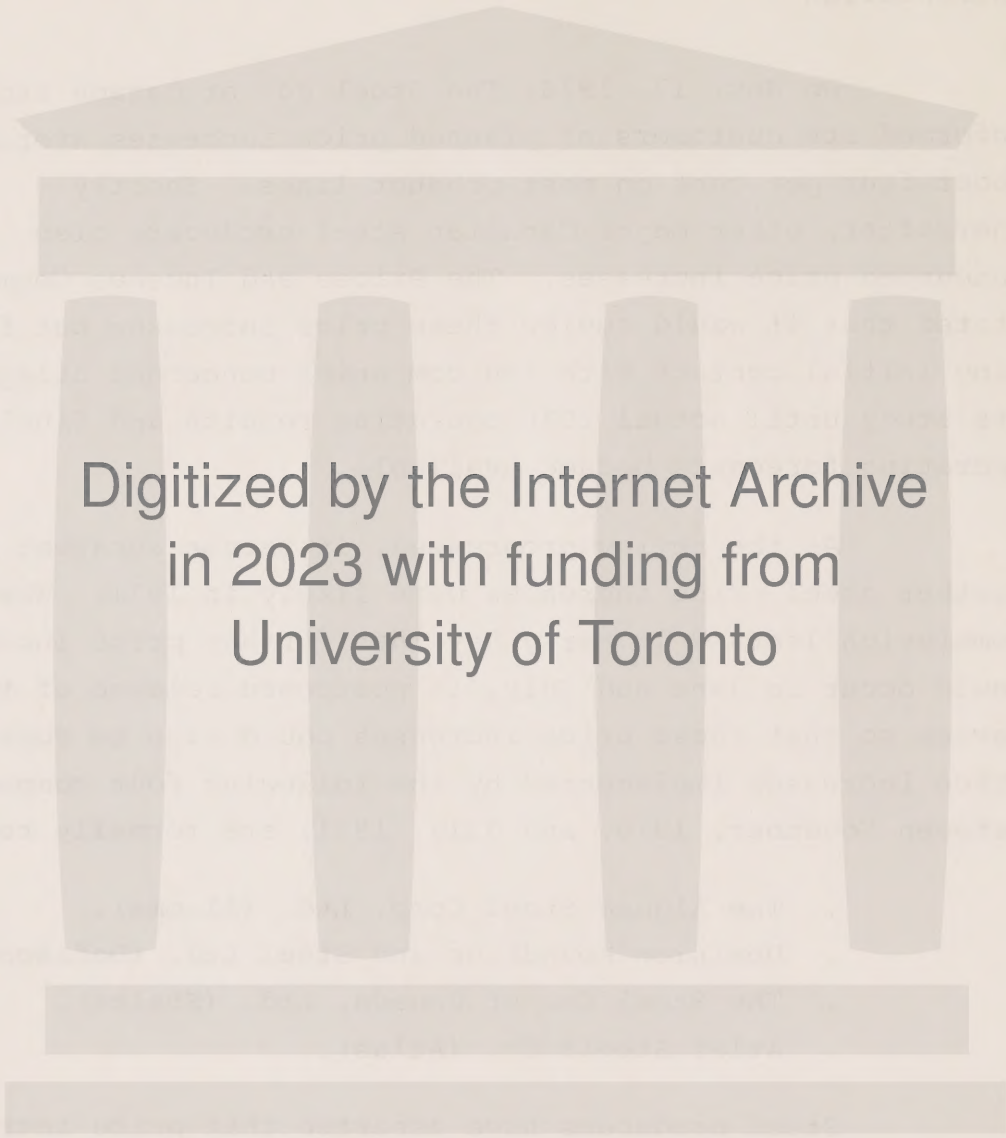
INTRODUCTION

On Nov. 17, 1970, The Steel Co. of Canada Ltd. informed its customers of planned price increases averaging about four per cent on most product lines. Shortly thereafter, other major Canadian steel producers also announced price increases. The Prices and Incomes Commission stated that it would review these price increases but following initial contact with the companies concerned delayed its study until actual 1970 operating results and final 1971 operating forecasts became available.

As the review progressed, it became apparent that further steel price increases were likely in 1971. When the Commission learned in early May that further price increases would occur in June and July, it postponed release of this review so that these price increases could also be considered. Price increases implemented by the following four companies between November, 1970, and July, 1971, are formally reviewed:

- The Algoma Steel Corp. Ltd. (Algoma).
- Dominion Foundries and Steel Ltd. (Dofasco).
- The Steel Co. of Canada, Ltd. (Stelco).
- Atlas Steels Co. (Atlas).

Steel producers have asserted that price increases effective during the period reviewed are clearly less than cost increases and comply with the formal price restraint criteria applicable in 1970. At the request of the companies price increases are evaluated on the basis of these criteria, even though they do not apply to price increases made in 1971.



This is the Commission's third review concerning steel prices. In March, 1970, a comprehensive report, "Steel and Inflation", was published which dealt with price increases during 1969. A review of tin plate price increases was published in April,1970. Data presented to the Commission by steel producers in the fall of 1969 indicated that price increases during 1969 approximately offset cost increases. The study of tin plate prices indicated that while the two producers, Stelco and Dofasco, met the formal price restraint criteria, the year 1970 was expected to be relatively profitable. Costs continued to increase, however, and the announcement in November, 1970, of yet another round of steel price increases was a reminder that extensive cost and price increases were still working their way through the Canadian economy.

The major cause of price increases cited by steel producers in 1970 was a sharp rise in raw material and energy costs. Most of this report, therefore, is devoted to an analysis of the consumption and costs of raw materials and energy in the Canadian steel industry.

Changes in costs and revenues incurred on rolling mill product sales have been emphasized in the Commission's two previous studies, while mining operations and prices and costs of fabricated steel products were not considered. Costs of raw materials, however, are difficult to analyse in isolation from investment in, and earnings from, raw materials sources. Significant price increases have occurred on products fabricated beyond the rolling mill stage. Revenue changes are difficult to analyse without including these price increases. This review, therefore, examined the three large integrated steel-makers, Algoma, Dofasco and Stelco on a corporate basis which permits inclusion of all revenue sources.

INDUSTRY ENVIRONMENT 1970-71

Production and Markets. Table I indicates that steel production was not notably affected by the general slow-down in economic growth experienced in 1970. This was due in part to the rebuilding of inventories at mills, warehouses and customers which had been depleted during 1969 strikes. Apparent domestic consumption of rolled-steel products in 1970, however, showed little increase over the 1969 level.

Steel production and shipments are expected to increase by historical average growth rates in 1971. Some production was lost in the first quarter due to maintenance work, particularly blast-furnace relines, but this is likely to be offset in the balance of the year. "Hedge" buying by customers of the United States steel industry, which faces labor negotiations, could further strengthen demand during 1971.

The somewhat slower rate of economic growth being experienced by many industrialized countries, combined with increasing world steel production capacity, is creating some excess supply of steel products. Lower levels of steel prices in international trade are resulting. The appreciation of the Canadian dollar exchange rate during the last year has further served to reduce prices of imported steel in Canada. Canadian producers are thus now facing stronger competitive pressures in both domestic and export markets than existed in 1968 and 1969 when world steel markets were very firm and the Canadian exchange rate was fixed.

TABLE I

CANADIAN STEEL INDUSTRY - PRODUCTION AND MARKETS

(Thousands of Tons)

	PRODUCTION		MARKETS - ROLLING MILL PRODUCTS				
	Pig Iron	Ingots and Castings	Domestic Shipments	Imports	Apparent Domestic Consumption	Exports For Sale	Total Mill Shipments
1955	3,215	4,534	3,057	911	3,968	402	3,459
1960	4,299	5,809	3,672	843	4,515	666	4,338
1965	7,079	10,068	6,492	1,904	8,396	610	7,102
1966	7,217	10,020	6,456	1,248	7,704	673	7,129
1967	6,951	9,701	6,075	1,172	7,247	872	6,947
1968	8,322	11,198	7,054	1,103	8,157	1,129	8,183
1969	7,461	10,307	7,208	1,618	8,826	707	7,915
1970	9,086	12,346	7,757	1,095	8,852	1,310	9,067

SOURCE: Dominion Bureau of Statistics and Prices and Incomes Commission.

Prices. Following eight years of stability steel prices rose by about four per cent in 1965 and again by about four per cent in 1967. The largest and most wide-spread price increases in more than a decade occurred in 1969 as average prices rose by more than six per cent. Prices on most products were increased again in 1970 by about four per cent. Most sheet- and bar-product prices have been increased by a further four per cent in 1971.

Changes in base prices since 1965 are summarized in Table II. Their number and complexity prohibits showing changes in price extras. Significant increases in some extras have occurred, notably in those relating to alloy content (particularly for copper, nickel and chrome) and in those relating to small shipments. Price increases experienced by small consumers have been greater than average increases.

Quite apart from cost factors, market conditions have an important bearing on steel price increases. In 1969 market conditions were conducive to price increases. The growing availability and declining prices of import steel at the present time offer some restraining influence. Steel price increases during the last eight months have thus been more moderate and have featured more price variances among companies than might otherwise have occurred.

Financial Performance. Combined financial operating ratics for the three major producers, Algoma, Dofasco and Stelco, in 1970 are compared with average ratios for the period 1959-68 in Table III. Ratios for 1969 are not used due to distortions caused by labor disputes. For all profitability measures used, the 1970 combined performance of the three companies is below the 10-year average.

TABLE II

ROLLING MILL PRODUCTS' PRICE HISTORY[1] JAN. 1, 196[illegible] 1971

$ Per Ton Unless Indicated
f.o.b. Hamilton Unless Indicated

	Base Price Jan. 1, 1965	Change During Period	Base Price Jan. 1, 1967	Change During Period	Base Price Jan. 1, 1969	Change During Period	Base Price 1970	Change During Period	Base Price Jan. 1, 1971	Change During Period	[illegible]
Blooms and Billets											
Carbon	97.00	5.00	102.00	5.00	107.00	12.00	119.00	8.00	127.00	[illegible]	[illegible]
Alloy	115.00	5.00	120.00	5.00	125.00	11.10	[illegible]	9.00	145.00	[illegible]	[illegible]
Bar Products											
Bars and Small Shapes											
Carbon (Merchant)	108.00	5.00	113.00	-	113.00	11.00	[illegible]	6.00	130.00	[illegible]	[illegible]
Carbon (Special)	117.00	7.00	124.00	5.00	129.00	12.00	[illegible]	8.00	149.00	[illegible]	[illegible]
Alloy	128.00	5.00	133.00	5.00	138.00	11.00	[illegible]	9.00	158.00	[illegible]	[illegible]
Bar Mill Band											
Carbon (Merchant)	108.00	5.00	113.00	-	113.00	11.00	[illegible]	6.00	130.00	[illegible]	137.00
Carbon (Special)	117.00	7.00	124.00	5.00	129.00	12.00	[illegible]	8.00	149.00	[illegible]	156.00
Alloy	161.00	5.00	166.00	-	166.00	11.00	[illegible]	9.00	186.00	[illegible]	193.00
Structurals (Angles and Zees)	108.00	5.00	113.00	-	113.00	10.00	[illegible]	7.00	130.00		130.00
Tie Plate	127.00	5.00	132.00	5.00	137.00	13.00	[illegible]	7.00	157.00	-	157.00
Plate (Carbon)	109.00	-	109.00	-	109.00	8.00	[illegible]	7.00	124.00	-	124.00
Tin Mill Products ($ Per Base Box)[2]											
Electrolytic - Single Red.	7.85	0.35	9.20	0.35	8.55	-0.40	[illegible]	0.45	8.60	[illegible]	[illegible]
Electrolytic - Double Red.	6.40	0.35	6.75	0.35	7.10	0.15	[illegible]	0.35	7.60	[illegible]	[illegible]
Black - Single Red.	7.05	0.25	7.30	0.35	7.65	-0.40	[illegible]	0.35	7.60	[illegible]	[illegible]
Black - Double Red.	-	-	6.45	-	6.45	-0.10	[illegible]	0.25	6.60	[illegible]	[illegible]
Galvanized											
Standard Coating	134.00	4.00	138.00	2.00	140.00	9.00	[illegible]	7.00	156.00	-	[illegible]
Culvert	140.00	4.00	144.00	-	144.00	6.00	[illegible]	7.00	157.00	[illegible]	[illegible]
Spangle Coating	134.00	4.00	138.00	6.00	144.00	10.00	[illegible]	7.00	161.00	[illegible]	[illegible]
Wiped Coating	132.00	4.00	136.00	1.00	137.00	8.00	[illegible]	7.00	152.00	-	[illegible]
Hot-Rolled[3]											
Sheet	99.00	4.00	103.00	4.00	107.00	7.00	[illegible]	6.00	120.00	[illegible]	[illegible]
Strip	100.00	4.00	104.00	3.00	107.00	7.00	[illegible]	6.00	120.00	[illegible]	[illegible]
Skelp	100.00	-	100.00	-	100.00	7.00	[illegible]	6.00	113.00	[illegible]	[illegible]
Cold-Rolled[3]											
Sheet	127.00	5.00	132.00	4.00	136.00	8.00	[illegible]	7.00	151.00	[illegible]	[illegible]
Strip ≤ .080"	127.00	5.00	132.00	6.00	138.00	10.00	[illegible]	9.00	157.00	[illegible]	[illegible]
Strip > .080"	133.00	5.00	138.00	6.00	144.00	4.00	[illegible]	9.00	157.00	[illegible]	[illegible]
Structural Shapes											
F.O.B. Sault Ste. Marie	110.00	5.00	115.00	4.00	119.00	4.00	127.00	7.00	134.00		134.00

1. Base prices only are shown. Extra prices have been substantially altered over the period.
2. Pricing method for tin mill products was changed to a base plus system April 1, 1969. While some base prices were revised downward, the net effect of this change is estimated to be a three per cent price increase. Tin mill product prices are based on 12,000-pound coils with 0.25 lb. coating on electrolytic. Basis weights are 75 pounds for single reduced and 55 pounds for double reduced.
3. Gauge and width extras on hot-rolled sheet and strip incorporated in base prices effective July 1, 1971. Effective 1971 price increase is about $7 per ton on hot-rolled and $8 per ton on cold-rolled.

SOURCE: Prices and Incomes Commission.

TABLE III

PROFITABILITY RATIOS: AVERAGE OF THREE MAJOR COMPANIES

	Average 1959-68	1970	1970 vs. Average
Net Income Before Tax as Per Cent of:			
Revenue	17.2	13.0	-4.2
Net Assets	12.7	8.8	-3.9
Equity	20.4	15.2	-5.2
Equity Plus Long-term Debt	17.3	11.6	-5.7
Net Income After Tax as Per Cent of:			
Revenue	10.0	9.0	-1.0
Net Assets	7.4	6.1	-1.3
Equity	11.9	10.5	-1.4
Equity Plus Long-term Debt	10.1	8.1	-2.0

SOURCE: Annual reports of Algoma, Dofasco and Stelco.

Profitability ratios calculated on the basis of before-tax income show a greater deterioration from the recent norm than do the ratios calculated on the basis of after-tax income. This is attributable to reduced rates of effective income tax experienced by the three large integrated steelmakers following their large investments in iron-ore mining operations in the mid-1960s. Tax credits in the form of a three-year tax exemption on income from new mines and a depletion allowance of one-third of mining income have reduced total corporate taxes.

These tax credits have been particularly attractive to domestic steelmakers as mining profits are calculated at the pig-iron stage of production for tax purposes. In the latter 1960s Algoma, Dofasco and Stelco all had interests in mining properties in the three-year tax-exempt period. Effective tax rates now are increasing as there are fewer mines in this tax position. Mineral tax credits have tended to obscure the cost-price squeeze experienced in the steel-making operations of the integrated companies as they have helped maintain reported after-tax profits at levels which would not otherwise have prevailed.

STEELMAKING*

Iron and Steel. Steelmaking is a multi-stage process analogous to the milling, smelting and refining of base metals. The process produces iron containing 0.01 - 1.7 per cent carbon. Wrought iron which contains less carbon is malleable and cannot be hardened by heating. Pig or cast iron contains more carbon and is very brittle.

Coke. Carbon comes from coke, the solid carbon residue remaining when coal is heated in the absence of air. Integrated steel producers manufacture the large quantities of coke they require in banks of coke ovens where blends of bituminous coal are baked. About 2,750 pounds of coal are required to produce one ton of coke.

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* Descriptive material in this report is taken from G.E. Wittur, Primary Iron and Steel in Canada, Mineral Resources Branch, Department of Energy, Mines and Resources.

Iron Ore. The primary ingredient of steel produced in integrated plants is iron ore. Most iron ore consumed today is in the form of pellets or sinter which may contain 60 - 65 per cent iron.

Pig Iron. Iron ore is smelted in blast furnaces to produce high-carbon pig iron. Coke, iron ore and a limestone-dolomite flux are continuously charged into the top of blast furnaces. Hot air and fuel oil or natural gas are "blasted" into the bottom of the furnaces forcing hot gases up through the iron-ore-coke-limestone mixture. This causes the coke to burn, giving off carbon monoxide which combines with oxygen in the iron to form carbon dioxide, leaving hot iron metal which melts and falls to the furnace bottom. The limestone collects impurities left from the ore and coke in a slag which floats on top of the molten iron. Slag and molten pig iron are removed from the furnaces every several hours.

Modern blast furnaces in Canada produce 3,500 tons of pig iron per day. Some 1,070 pounds of coke, 2,900 pounds of iron ore and 300 pounds of combined limestone and dolomite are used to produce one ton of pig iron. Approximately 10 per cent of pig iron produced is used directly for products such as castings and automobile engine blocks. The remaining 90 per cent is used to manufacture steel.

Steelmaking. Molten pig iron is taken from blast furnaces to steelmaking furnaces where it is refined to reduce the carbon content. An additional source of iron, steel scrap, is also used in steelmaking furnaces. Heat is applied to a mixture of pig iron, scrap and fluxes to produce oxygen which combines with carbon and other impurities in a slag leaving iron with the desired carbon content.

Two types of steelmaking furnaces are used in integrated steel plants:

- Open-Hearth - Hot flames, generally burning oil or gas are passed over the iron-scrap mixture to melt scrap and oxidize or burn out impurities. There is some flexibility of input and the charge may range from 50 - 70 per cent pig iron and 30 - 50 per cent scrap steel.
- Basic-Oxygen Furnaces - Pure oxygen is blown at high velocity into the iron-scrap mixture. The resulting oxidization of impurities generates heat and no other energy is required. Steel is produced in smaller batches than in most open-hearth furnaces but the time required to produce a batch is greatly reduced. The input mix is not as flexible as in open-hearth furnaces, being 70 - 75 per cent pig iron and 25 - 30 per cent scrap.

An alternate form of steelmaking exists whereby steel scrap is re-processed into finished steel in non-integrated plants. These plants use electric arc furnaces in which a strong electric current jumps from three electrodes protruding from the furnace top to the scrap and melts it. Electric furnaces can be highly efficient at small volumes of production and are suited to the production of specialty steels.

Open-hearth furnaces are declining in importance. Integrated steel producers are turning to basic-oxygen furnaces which offer greater production efficiency and most new steel-making capacity will be of this type. Electric furnaces are also becoming more prevalent as small non-integrated producers expand operations based on scrap assembly and production of a narrow product range in a local market.

Rolling Mill Products. Molten steel is poured from steel furnaces into ingot moulds or continuous casting (concast) machines. Ingots and concast shapes are then processed in rolling mills to the final form required. The amount of rolling may be minor as for bar products or extensive as for tin plate. The more rolling done the greater is the yield loss from the original ingot ton of steel produced. Depending upon the product mix, an ingot ton of steel will yield 1,200 - 1,800 pounds of rolled steel, with the average yield about 1,500 pounds. Yield losses in rolling provide some 60 per cent of the steel scrap consumed in steel furnaces.

Fabricated Products. Some Canadian steel producers have integrated forward into manufacturing operations not formally defined as part of the iron and steel industry. These operations take rolling mill products and manufacture end products such as pipe, tubing, wire, fasteners of all types and fencing.

COSTS OF RAW MATERIALS AND ENERGY

Cost Analysis. Published data and data collected from various companies have been used to analyse average costs of principal raw materials, energy and employment for the entire Canadian steel industry. Costs are related to tons produced although there are analytical difficulties in doing so because: Steelmaking is a multi-stage process where the output of one stage is not the exact input of the next stage; continuous changes in product mix and quality affect yield factors at all production stages; and continuous changes in production processes, such as the shift from open-hearth to

TABLE IV

COSTS OF PRINCIPAL RAW MATERIALS AND ENERGY CONSUMED - CANADIAN STEEL INDUSTRY, 1961 - 1971[1]

(Dollar Cost Per Ingot Ton of Steel Produced)

	1961	1962	1963	1964	1965	1966	1967	1968	1970	1971 Est.
Coal	6.73	6.49	6.03	5.75	5.36	5.77	5.78	6.02	7.74	8.91
Iron										
. Ore[2]	13.96	14.47	14.42	14.27	13.57	13.09	13.34	13.87	14.43	14.63
. Purchase Scrap	6.72	6.21	5.64	6.89	6.92	6.00	5.96	5.16	7.67	6.98
. Total Iron	20.68	20.68	20.06	21.16	20.49	19.09	19.30	19.03	22.10	21.61
Alloys[3]	3.61	3.59	3.38	3.44	3.74	3.83	4.13	4.21	4.80	4.94
Fluxes[4]	1.24	1.15	1.08	1.03	0.97	0.91	0.90	0.95	0.98	1.02
Refractories	1.82	2.00	1.87	1.93	1.93	1.94	2.38	1.92	1.91	1.95
Moulds	1.44	1.27	1.35	1.37	1.39	1.43	1.59	1.72	2.00	2.23
Total Materials[5]	35.52	35.18	33.77	34.68	33.88	32.97	34.08	33.85	39.53	40.66
Energy	4.58	4.41	4.28	4.54	4.74	4.94	5.23	4.72	5.19	6.11

1. 1969 Omitted due to distortions caused by labor disputes.

2. Purchase ore costs used to impute own-make ore costs.

3. Includes all ferro-alloys, calcium, manganese, chrome, tungsten, aluminum, copper, nickel and other metals charged to steel furnaces.

4. Includes limestone, lime, and dolomite.

5. Cost shown include over 95 per cent of actual material costs.

SOURCE: Dominion Bureau of Statistics, Department of Energy, Mines and Resources, Prices and Incomes Commission.

basic-oxygen furnaces, have complex effects on average industry costs. Data shown are qualified where necessary but do represent a reasonable portrayal of the cost performance of the steel industry over the last decade. Table IV shows costs of principal raw materials and energy per ingot ton of steel produced for the years 1961-71.

Coal. While the quantity of coal required to produce a ton of coke has remained fairly constant, the coke rate (the quantity of coke required to produce a ton of pig iron) has declined from some 1,430 pounds in 1961 to about 1,070 pounds in 1970. This improvement is attributable to improvements in blast furnace technology which include: The use of upgraded iron ore; larger and better designed blast furnaces; increased fuel injection and oxygen enrichment of the blast; and operation under higher temperature and pressures.

The improved coke rate combined with fairly stable coal prices led to a decline in average coal costs per ingot ton of steel produced from $6.73 in 1961 to $5.36 in 1965. In the latter 1960s and particularly in 1970, however, coal prices have risen sharply as shown by Table V. These price increases are expected to raise average coal costs per ingot ton to $8.91 in 1971.

TABLE V

COKING COAL - AVERAGE COST PER TON

(Delivered at Steel Mills - Canadian Dollars)

1962	$11.23	1967	$11.56
1963	11.22	1968	11.71
1964	11.13	1969	12.47
1965	10.90	1970	15.51
1966	11.49	1971Est.	18.00

SOURCE: Dominion Bureau of Statistics and Prices and Incomes Commission.

Most coking coal consumed in Canada is imported from the United States. The high sulphur content of Nova Scotia coal limits its desirability for metallurgical coking uses. Western Canada coal has a low sulphur content but a high ash content which causes blast-furnace inefficiencies. The much higher quality and lower freight cost of United States coking coal limit the potential of other supply sources, even at present price levels.

Coal prices are determined in open market transactions and change frequently. Rising prices are caused by market and institutional factors. The major buyers are the thermal electric power industry and the steel industry. Low profits in coal mining and pessimistic demand forecasts assuming a substitution of nuclear for thermal power have limited increases in coal supply. Nuclear power generation, however, is years behind original forecasts and coal requirements of the power-generating and steel industries have increased sharply. This growing supply-demand imbalance has been compounded by new underground safety regulations affecting United States mines. There is little likelihood of relief from rising coal prices and some possibility that more lower-grade coals involving higher steel production costs will have to be used.

Iron Ore. Most iron ore consumed in blast furnaces was in a natural form grading some 50 per cent iron until the early 1950s. Depletion of high-grade-ore supplies combined with potential reductions in iron conversion costs led to the development of upgrading processes which permitted the use of low-grade-ore deposits and the consumption of agglomerate containing a high iron content in blast furnaces. The two most common agglomerating processes are pelletizing and sintering.

This development probably caused a greater change in the economics of the integrated steel producers than any other development since the Second World War. It is an important factor in the shift which has occurred from dependence on foreign sources of ore to dependence on domestic sources of ore. It has led to savings in the conversion cost of pig iron and it has contributed to efficiencies in materials handling.

Canadian iron-ore production has, for some years, exceeded domestic consumption. Until the mid-1960s, however, most domestic consumption was imported ore, primarily because existing domestic-ore producers were affiliated with United States steelmakers or had long-term export contracts while Canadian steelmakers had affiliations with United States ore producers. In recent years Canadian steel producers have expanded their ownership of domestic production sources and in 1970 imports accounted for less than 20 per cent of domestic iron-ore consumption.

Consumption of iron ore per ingot ton of steel produced has declined from some 2,200 pounds in 1961 to some 1,850 pounds currently. This is entirely due to the higher iron content of material now used.

Iron-ore prices vary by the iron content and the physical and chemical characteristics of the ore. The price per unit of iron is the usual means of comparing ore prices.* An established mechanism exists for setting prices of most iron ore produced in Central and Eastern Canada for sale in North America whereby the dominant traders set the price for a long-ton unit of iron in ore delivered at rail of vessel at Lake Erie ports. This Lake Erie base price is essentially a "producers"

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* A unit of iron equals one per cent of a ton. An ore containing 65 per cent iron therefore has 65 units.

price and is related to costs. There is also a free-market price for iron ore. Buyers are steel mills, primarily in Europe, not having a sufficiently large tied iron-ore supply and sellers are mines not having all their output tied to buyers on a long-term basis. As this is a marginal market, there are frequent price fluctuations in response to supply and demand changes. These prices are, however, frequently below Lake Erie base prices.

Lake Erie base prices rose steadily from the Second World War until 1962 when they declined seven per cent. There was a further slight decline in 1963 following which prices were stable until 1970. Increases occurred in 1970 and 1971 in response to higher production and transportation costs. Pellet prices for the years 1963-71 are shown in Table VI.

TABLE VI

LAKE ERIE BASE PRICE FOR IRON PELLETS, 1963-71

(United States Dollars)

	Per Iron Unit	Per Ton 65% Iron
1963-69	$0.252	$16.38
1970	0.266	17.29
1971	0.280	18.20

SOURCE: Prices and Incomes Commission.

The average iron-ore cost per ingot ton of steel produced, as shown in Table IV, is influenced by the price of ore, changes in the mix of ore used and the relative consumption of ore and scrap. Ore consumption in 1971 is expected to be slightly below normal due to extensive blast-furnace relines so the effect of price increases is not apparent. In approximate terms, however, a one-per-cent increase in ore prices equates to a 15-cents-per-ton increase in steelmaking costs.

Vertical Integration and Mineral Income. The preceding discussion of coal and iron-ore costs is based on market prices of these materials. Algoma, Dofasco and Stelco obtain the bulk of their ore requirements from affiliated mining operations. Most of the coal consumed by Algoma and Stelco comes from affiliated mines in the United States. Dofasco purchases most of its coal needs on the open market. Such vertical integration represents a means of circumventing factor markets and is motivated by both an unwillingness to rely on such markets for necessary materials and the profit opportunities afforded by owning captive supply sources.

In the case of coal, an organized and competitive market appears to exist with the prevailing market prices reflecting current demand and supply conditions. Profits derived by steelmakers from owned coal mines are the market price of coal less the production costs incurred.

In the case of iron ore, an argument can be made that an organized competitive market does not exist between unique sellers on one hand and unique buyers on the other. Steelmakers calculate profits from owned iron mines as the difference between Lake Erie base prices and the production cost of the ore. These prices, however, may not represent the real alternative selling or purchase prices for ore. Given the economics of integrated steelmaking, the structure of the North American iron-ore industry

and present income tax provisions, the prevalent view is that iron-ore production is simply the first stage of the steel-manufacturing process and cannot be considered separately from it.

As Lake Erie base prices do not necessarily reflect the real cost of iron ore consumed by steelmakers from affiliated mines, mineral income from these mines cannot be considered distinct from raw material costs. Income from coal-mining operations, despite rising prices, is not as significant. Total mineral income of the three major companies combined increases from $2.90 per ingot ton produced in 1968 to an expected $3.50 in 1971. This income is taken into account in the following individual company reviews. It must be noted, however, that if mining income is considered a deduction from steelmaking costs, then profits must be considered in relation to capital invested in both steelmaking and mining operations as was done in Table III.

Steel Scrap. Approximately 60 per cent of the scrap consumed in steelmaking is "own-make" scrap generated in the production of saleable steel products. The remaining 40 per cent is "purchase" scrap bought from traders who assemble steel scrap from sources such as demolished buildings, old bridges, railways and automobiles. Own-make scrap does not have a direct cost. The conversion of steelmaking costs from an ingot-ton basis to a finished-product-ton basis as in Table VII is one way of making an allowance for costs of this material.

Scrap markets tend to be regional with the purchasing practices of the largest local buyer determining the price. As imbalances develop in natural regional markets, however, broader trading areas emerge and from time to time large export and import shipments occur.

Most steel companies purchase scrap through brokers who are informed of prices companies are prepared to pay for the various grades of scrap. If the supply forthcoming at announced

prices exceeds the companies' needs lower prices are offered and if needs are not met higher prices are offered. Both brokers and dealers generally operate on fairly constant margins between buying and selling prices but there are opportunities for speculation.

Scrap supply is largely a function of price. Demand, however, is related to a number of conflicting factors such as the over-all demand for steel, the quantity of own-make scrap available, the relative importance of the different types of steel furnaces in production, the cost and availability of pig iron and the strength of export markets for scrap.

Average purchase costs of scrap have generally stayed within the narrow range of $28 - $32 during the last decade with two periods of exception. In 1965 average purchase costs exceeded $34 per ton. In late 1969 the largest increase in scrap prices for the period examined began and prevailed throughout 1970. For example the price of No. 1 Heavy Melting Scrap, the prime grade, was about $30 per ton in Toronto in mid-1969. This price rose to $43.50 in April, 1970, but during the last several months has fallen back to about $34 per ton. Prices for other grades of scrap, which are priced lower, display similar trends.

Average scrap consumption per ingot ton of steel produced in Canada is fairly stable at 900 - 1,000 pounds. Own-make scrap, however, is accounting for a steadily increasing share of this consumption. Purchase scrap costs per ingot ton, as shown in Table IV, fluctuate between $5 and $7 per ton, except in 1970 when scrap costs rose above $7 per ingot ton. Steelmakers using pig iron consume about 400 pounds of purchase scrap per ingot ton. Thus a $1 change in scrap prices changes steelmaking costs by 20 to 25 cents per ingot ton. For steelmakers using electric furnaces, however, scrap prices are much more important as a $1 change in scrap prices changes costs by a similar amount. As the latter cannot normally adjust product prices in line with scrap prices, profits are closely tied to scrap prices.

Alloys. A number of additive agents are used to provide special properties to basic steel, the most important being ferro manganese, ferro silicon, ferro chrome, silica manganese and base metals such as nickel and copper. Consumption of these alloys is fairly constant at about 28 pounds per ingot ton of steel, although the mix of alloys used changes. The cost increase shown in Table IV from $4.21 per ingot ton in 1968 to $4.84 in 1971 is almost entirely due to price increases. For example, chrome and nickel, the two major additives used in making stainless steel, have increased in price by 55 per cent and 36 per cent respectively between 1968 and 1971.

Fluxes. Limestone and dolomite are the major fluxes used in blast and steel furnaces to collect impurities in slag. They are generally supplied from quarries near steel plants. Consumption has fallen over the last 10 years from about 450 pounds per ingot ton to about 300 pounds per ingot ton due to the increased iron content of ore used and the decline in the coke rate which have reduced the quantity of impurities present and reduced slag requirements. Prices have increased about 10 per cent in the last three years.

Refractories. Blast furnaces, steel furnaces and other parts of steelmaking plants where heating and melting operations occur are lined with refractories which must be replaced regularly. Refractory costs per ingot ton are relatively constant over the period examined. This relates to declining consumption as prices of many refractory items are increasing.

Ingot Moulds. Ingot moulds are manufactured from cast iron. As prices of iron and steel products have risen so have prices of ingot moulds. Part of the increased costs shown in Table IV, however, is due to an increase in the number of moulds in use as companies attempt to improve efficiency of pouring floors.

Energy Costs. Three major forms of purchased energy are used in steelmaking: Fuel oil, natural gas and electricity. Average fuel-oil consumption per ingot ton has declined from a peak of 22 gallons in 1964 to about 16 gallons at present. Fuel-oil prices were between 8.5 and 9.0 cents per gallon from 1961-70. In recent months prices have risen sharply and are expected to average 13.5 cents per gallon in 1971.

Natural-gas consumption has increased from some 900 cubic feet per ingot ton of steel produced in 1961 to about 1,800 currently, largely because of the increased application of energy to enhance productive efficiency. Natural-gas cost has fallen from an average of 50.5 cents per thousand cubic feet in 1961 to an estimated 47.5 cents in 1971.

Average electricity consumption in the steel industry is fairly constant at just under 400 killowat hours per ingot ton of steel produced. Electricity costs have increased from 1964 onward with a sharp increase of over 17 per cent between 1968 and 1971.

Total energy costs fluctuated within a fairly narrow range between 1961 and 1968. The estimated cost increase from $4.72 per ingot ton in 1968 to $6.11 per ingot ton in 1971 is almost entirely due to increased fuel-oil and electricity prices.

COST INCREASES 1968-71

Principal Raw Materials and Energy. Principal raw material and energy costs per ingot ton of steel produced are converted to costs per ton of finished product in Table VII. This conversion indicates the problem of using unit-ton measures. A change in the yield of finished product to ingot tons can significantly change costs per ton of finished product. The average yield factor of 0.75 is used in the table for simplicity.

Raw material and energy costs were on a declining trend in the period 1961-67 largely because of efficiency gains in materials usage. Since 1968, however, raw material and energy costs have risen sharply due to rising prices and the absence of efficiency gains.

Labor Costs. Total labor costs per finished-product ton are shown in Table VII for the years 1968-71. Trends in labor costs in the steel industry were examined in the Commission's earlier report, "Steel and Inflation". That examination indicated that relatively moderate increases in wage and salary rates occurred in the early 1960s and that employment costs per ton of shipments were on a declining trend. These circumstances have been reversed in recent years.

Wage increases at Dofasco and United Steelworkers of America agreements signed with Stelco and Algoma in the fall of 1969 have had a major influence on labor costs in the steel industry. The latter agreements are for three years providing total wage and benefit increases of some 30 per cent, weighted in favor of the first two years. Employment costs per ton of finished product rose sharply between 1968 and 1971.

Maintenance and Operating Supplies. Regular maintenance and supply costs, which include such things as equipment and tools not capitalized, outside labor and shipping containers,

TABLE VII

CANADIAN STEEL INDUSTRY - INCREASED COSTS OF RAW MATERIAL, ENERGY, AND EMPLOYMENT, 1968-71[1]

(Dollars Per Ton of Finished Product Produced For Sale)

				Increased Costs		
	1968	1970	1971 Est.	1968-70	1970-71	1968-71
Cost of Principal Raw Materials Consumed Per Ingot Ton Produced	33.85	39.53	40.66			
Cost of Energy Consumed Per Ingot Ton Produced	4.72	5.19	6.11			
Yield of Finished Product Per Ingot Ton Produced	0.75	0.75	0.75			
Principal Raw Material and Energy[2] Cost Per Ton Finished Product	51.43	59.63	62.36	8.20	2.73	10.93
Employment Cost Per Ton[3] Finished Product	46.84	51.12	54.57	4.28	3.45	7.73
Maintenance and Supplies[3]	12.95	14.57	15.03	1.62	0.46	2.08
Overhead Expense[3][4]	20.09	19.72	23.01	-0.37	3.29	2.92
Total Above Costs[5]	131.31	145.04	154.97	13.73	9.93	23.66

1. 1969 omitted due to distortions resulting from labor disputes.
2. Energy and material cost per ingot ton divided by average yield factor of 0.75.
3. Small portion of these costs is applicable to non-steel items. Absolute costs are thus slightly overstated but increments are reasonably accurate.
4. Includes: Depreciation, municipal taxes, interest income and expense, furnace reline provisions, administration, selling and research expense exclusive of labor and sundry expenses.
5. Includes more than 95 per cent of the average steelmaking costs in the industry.

SOURCE: Prices and Incomes Commission.

are a major expense in steelmaking. Costs per finished ton increased sharply between 1968 and 1970. This was partly due to price factors and partly due to some deferment of maintenance in 1968 and 1969. The steel industry has been operating at very high rates of capacity, perhaps even beyond efficient levels in 1968 and maintenance work has not always been kept up.

Overhead Expenses. Overhead expenses, while fairly constant between 1968 and 1970, increased sharply in 1971. This is primarily due to increased debt charges resulting from increased borrowing by the major steelmakers in 1971. Other overhead expenses which increased notably are depreciation charges, reflecting new equipment coming into use and municipal taxes.

Transportation Costs. Delivered costs of materials and supplies are used throughout this analysis. Similarly, in analysing individual company revenues, net revenues at mill are used. Transportation costs, therefore, are not separately identifiable. Data prepared by several companies, however, indicate that transportation costs are one of the largest single factors in cost increases and account for more than 10 per cent of the increase in the delivered cost of material. Particularly large increases occur in railway freight costs and ship loading and unloading charges.

COMPANY REVIEWS

Procedure. Differences between incremental costs and revenues experienced by the four companies formally reviewed in this report are examined below. The primary purpose of these reviews is to assess whether price increases implemented in the fall of 1970 comply with the voluntary price restraint criteria applicable in 1970. At the request of the companies, 1971 price increases are also evaluated on the basis of the 1970 pricing criteria.

The year 1969 could not be used as a reference point in this study due to distortions caused by lengthy labor disputes in the steel industry. Thus, incremental costs and revenues are analysed using 1968 as a base. In assessing the results of this study it should be noted that for Dofasco and Stelco 1968 was a year of high profits.

Incremental costs and revenues are influenced by product-mix changes. Analysis indicates that product-mix in the years 1968 and 1971 is comparable for most companies.

Detailed sales, revenue and cost data for the years 1968 to 1971 were obtained by the Commission from each company reviewed. Assumptions underlying 1971 forecasts were evaluated by Commission staff and 1971 data used in this report represent the best estimates available to the Commission at this time.

Algoma. A base period representing operations at a normal volume of output and sales is difficult to establish for Algoma as labor disputes affected operations in the years 1965 to 1969. The year 1968 is used as a base in this review, although costs in that year are slightly higher than would have resulted had operations not been interrupted by work slow-downs throughout the year. Between 1968 and 1970 cost increases exceeded revenue increases by $1.48 per finished product ton sold at Algoma. Using 1971 forecasts, cost increases exceed revenue increases by $2.57 between 1970 and 1971. Over the three-year period 1968 to 1971 cost increases exceed revenue increases by $4.05 and before-tax profits per sales ton are eroded by this amount. This erosion occurs despite the fact that significant improvements in volume and output per man-hour experienced by Algoma since 1968 result in an understatement of the effects of cost increases.

Dofasco. There are also problems in choosing a representative base year for Dofasco as the company enjoyed an exceptional year in 1969 when both Algoma and Stelco experienced lengthy strikes. In this analysis, 1968 is used although the use of 1969 yields similar results. Revenue increases per sales ton in 1970 over 1968 are $3.37 less than cost increases over the same period. Cost increases in 1971 over 1970 are expected to exceed revenue increases by $1.72 per sales ton. The cumulative effect over the three-year period 1968 to 1971 is that cost increases exceed revenue increases by $5.09 per ton and before-tax profits per sales ton are eroded by this amount.

Stelco. Costs and revenues of Stelco are analysed on the basis of the entire company which includes a significant volume of fabricated steel products. Unit costs for Stelco in the years 1969-70 are distorted by the fact that large volumes of crude steel were purchased from other steelmakers for use in rolling mills and fabricating plants. Revenue increases in 1970 over 1968 are $4.64 per sales ton less than cost increases and are about equal to cost increases in 1971 over 1970. Over the three-year period 1968-71 before-tax profits per sales ton decline by $4.41, the cumulative amount by which cost increases exceed revenue increases during the period.

Atlas. Atlas is the largest Canadian manufacturer of stainless and specialty steels. Its major products are high-alloy steels not produced by other Canadian steelmakers. While processes for manufacturing specialty steels are analogous to those for manufacturing regular carbon steel, the economics of specialty steelmaking are very different.

Stainless steels are characterized by a unit price of some $1,000 per ton versus an average of some $170 per ton for

regular carbon and low-alloy steel. Specialty steels thus move freely in international trade as transportation and distribution expenses are low in relation to selling costs. Atlas is more active in export markets than other Canadian steelmakers and faces more import competition.

Atlas uses electric furnaces for steelmaking and relies entirely on carbon steel scrap as a source of iron. Profits, particularly on low-alloy and carbon steels, are directly tied to prices for scrap.

Alloy consumption is as much as 500 pounds per ingot ton for stainless-steel products produced by Atlas, as compared to an average of 28 pounds per ingot ton for all steel produced in Canada. Alloy costs are thus very important in specialty steelmaking. Chrome, nickel and tungsten represent approximately 60 per cent of Atlas' raw material usage and costs of these alloys have increased 55 per cent, 36 per cent and 44 per cent respectively from 1968 to 1971.

Employment costs at Atlas have increased in line with those in the industry. Specialty steelmaking, however, is more labor intensive than regular steelmaking and rising employment costs have a more severe effect on Atlas.

Despite these cost pressures, Atlas experienced some improvement in financial performance in late 1969 and early 1970 although the financial results of Atlas remained well below the average results of the three integrated producers shown on Table III. This improvement was somewhat artificial as it related in part to the heavy demand for stainless-steel products created by the strikes at major Canadian nickel producers in the latter part of 1969. Atlas has an international marketing network which allowed it to take advantage of the strong demand and substantial price increases experienced in international markets in the aftermath of the nickel strikes.

Since mid-1970 supplies of nickel and nickel-bearing materials have returned to normal while demand has fallen sharply. International prices of stainless and specialty steels have fallen back to or below their pre-strike levels. This decline in international prices has put considerable pressure on Atlas in both domestic and export markets.

The great variety of products of a specialty steel company such as Atlas presents product mix complications which significantly influence any average price or cost comparisons. Data have, however, been collected for particular elements of cost and related to average price increases. Raw materials, labor and overhead costs have increased some 30 per cent between 1968 and 1971. In the same period the domestic price of stainless flat rolled and low-alloy products has increased by an average of some 15 per cent.

The favorable export market experienced by Atlas in early 1970 served to offset the impact of escalating costs for a period. If the price competition experienced by Atlas in recent months continues, however, Atlas will experience a significant profit decline in 1971.

Compliance with Price Criteria. Revenue increases per ton of product sold are clearly less than cost increases between 1968 and 1971 for Algoma, Dofasco and Stelco. Price increases implemented by these companies in the fall of 1970 and in the first six months of 1971 meet the voluntary price restraint criteria in effect during 1970. In the case of Atlas Steels, where unit measurement is not possible, the combination of declining prices on major products combined with increasing production costs more than offsets revenue generated by price increases implemented.